

PRE-INCIDENT PLANNING IN THE 21ST CENTURY

EXECUTIVE ANALYSIS OF FIRE SERVICE OPERATIONS IN EMERGENCY MANAGEMENT

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ABSTRACT

The problem was the Greensboro Fire Department did not have a standard pre-incident planning method for recording vital information needed on the emergency scene. The purpose of this research project was to analyze pre-incident planning and determine a method of improvement for the Greensboro Fire Department. The project used Historical and Action Research to answer the following questions:

- (1) Are there nationally recognized standards for fire department pre-incident planning?
- (2) How does pre-incident planning relate to emergency scene activities?
- (3) What documentation methods are currently used in pre-incident planning?
- (4) What information is needed when conducting pre-incident planning?

The procedures used to complete the research project consisted of a literature review beginning at the National Fire Academy and included research locally. Personal interviews were also conducted with Greensboro Fire Department personnel. A committee was formed to further study the revision of the existing Pre-Incident Planning Program. Information was compiled and an outline was developed to establish key points that related to the four research questions.

The results of the project identified limited research previously conducted by the fire service community in recent years. Little information was available on technology based pre-incident planning programs. However, several national organizations have published documents relating to pre-incident planning that provided a basis for the research project. Fire service leaders supported each other in saying that pre-incident planning makes the emergency scene operate more efficiently and safer for the firefighter. Unforeseen was the fact that one professional organization requires all commercial and industrial structures to be pre-planned

twice per year. Also locally, no formal program guidelines were available for the existing program.

This researcher recommended a general operating guideline be implemented. Supporting documentation was provided with a priority matrix. A Field Collection Sheet was also developed to assist fire companies in obtaining needed information.

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INTRODUCTION

District Chief Mike McNamee of the Worcester, Massachusetts Fire Department, had not heard a sound, no loud pop or explosion over the roar of the flames. He wondered if the top floor had flashed, if hot gases had pushed into rooms coated with asphalt-infused cord and Styrofoam until everything had ignited. All he knew for sure, though, was that the smoke had pushed into the hallways and lockers, overflowing and pushing, pushing out until it collapsed down the stairwell, a force seemingly overwhelming physics, a searing, noxious mist settling in on the floors below.

“I want everyone on the top floors down to the ground now!” he hollered up the stairwell. “And I want head counts. I want everyone accounted for.” Then he gave the same command over the radio, fumbling for his face piece in the dark.

Then Paul Brotherton, still searching for the homeless tramps with Jerry Lucey, keyed his radio for the first time, answering his chief from somewhere high up in the warehouse. “We’re deep in the building, he said, and we don’t know which way to go to get out.”

Later Brotherton’s voice came over the radio again. “We’re on the floor. We’re buddy-breathing. Hurry. Time passed for the next transmission. Brotherton said, “Hurry, please hurry.”

By 7:30, McNamee could no longer deny his worst fears. The rescue, he realized, had turned into a recovery (Flynn, 2000).

The fire on December 3, 1999 in Worcester, Massachusetts was tragic to the nation’s fire service. Six firefighters died on that cold night. Did it have to turn out that way? We will never know for sure. However, everyone in the City of Worcester knew about the building. Civilians

knew about it because of the giant painted words: WORCESTER COLD STORAGE AND WAREHOUSE CO. Firefighters knew about it and dreaded it. Hardly any of the firefighters had ever been in the property though. Even one of the fire inspectors from the Department had gotten lost in the building during a routine fire inspection. He told himself, “We’d better never get a fire in there.” But still, a pre-incident plan had never been conducted (Flynn, 2000).

Pre-incident planning can be directly related to increased fire loss and firefighter injuries and deaths (Price, 1992). Technical reports compiled by the United States Fire Administration (USFA) and investigated by the National Institute for Occupational Safety and Health (NIOSH) indicate the lack of pre-incident planning were contributing factors to the loss of life of firefighters and civilians (Price, 1992).

Two firefighters died in a structure fire in Pennsylvania when the floor collapsed in 1993. One of the key issues identified by the USFA was the lack of a written fire plan. The building had unique problems that could not be visualized without a fire plan. Four firefighters died in a warehouse fire in Washington in 1995. The USFA report stated the fire department did not have a pre-fire plan of the building. The six firefighters who died in Massachusetts in 1999 did not have a pre-fire plan of the building according to the NIOSH report (Price, 1992).

Pre-fire planning or pre-incident planning is not a new concept. Pre-incident planning is defined by noted fire service professional Francis Brannigan as, “A key element for fire professionals. Its value cannot be overstated. Without it firefighters are reduced to just reacting to a fire rather than being prepared for its many potential hazards” (Willy, 1998). An article written in 1978 described a fire at a major paint and varnish supplier in the City of Commerce, California. The large fire involved paints, varnishes, and many other hazardous substances. The post fire analysis indicated that the entire building and a 10,000 gallon lacquer tank would have

been consumed if it had been for adequate separation of stock, an adequate water supply, and pre-planning by fire prevention officers and first and second alarm companies (Bragdon, 1978).

The goals of the USFA set by *America Burning* in 1974 suggested a reduction of fire and life loss by 5% per year for a five-year period (Phelps and McDonald, 1984). The current goals set by the USFA are to reduce by twenty five percent the loss of life of the fourteen years and under, the sixty-five years and older, and firefighters (USFA, 2002).

The Greensboro Fire Department is no different than the rest of the nation. Our current goals also include firefighter safety and considerable involvement in the community in the fire problem areas of the City. The fire safety message is focused on the young and elderly citizens in the community (Nix and Ritter, 2002).

After maintaining a Class I rating, the recent Insurance Services Office (ISO) inspection indicated an area where improvement may be made in pre-fire planning inspections, as referred to by the ISO Grading Schedule. "The Greensboro Fire Department Leadership team is dedicated to maintaining an ISO Class I Rating. Pre-planning is an area that we have been involved with for years so improvement to our current program should be a relatively simple process," according to Deputy Fire Chief of Emergency Services, B.C. Cox (Personal Communications, August 12, 2002).

The problem was the Greensboro Fire Department did not have a standard pre-incident planning method for recording vital information needed on the emergency scene. The information that was obtained was kept in three ring binders that were not routinely used on emergency scenes due to the limited amount of information contained in them. However, each fire unit carried as many as four 2-inch binders full of pre-incident plans. The current format of conducting pre-incident planning was implemented in the late 1970's and had not been updated

since. The city is now over 125 square miles with over 13,000 business occupancies within the city limits (Planning and Research Officer, Alan Cagle, Personal Communications, August 12, 2002). “Our old method just doesn’t work anymore,” as said by Assistant Fire Chief Warren Ritter (Personal Communications, August 21, 2002).

The purpose of this applied research project was to analyze pre-incident planning and determine a method of improvement for the Greensboro Fire Department. In order to do this, Historical research was conducted from selected fire departments across the country over the past decade and in some cases even longer. Action research was then used to develop guidelines for updating the pre-incident planning program in Greensboro. The program includes a matrix to determine selection priority, a field information collection sheet, new forms for recording/retrieving information through technology by officers on the emergency scene, and a general operating guideline. The two types of research were applied to the chosen research questions:

- (1) Are there nationally recognized standards for fire department pre-incident planning?
- (2) How does pre-incident planning related to emergency scene activities?
- (3) What documentation methods are currently used in pre-incident planning?
- (4) What information is needed when conducting pre-incident planning?

BACKGROUND AND SIGNIFICANCE

The City of Greensboro, North Carolina currently covers a land area of over 125 square miles with a growing population of almost 239,000 (Greensboro Fire Department, 2002). The Fire Department operates a fully paid staff of three, 24-hour shifts. Apparatus are staffed by a company officer (Captain), a fire equipment officer (FEO), and normally two firefighters and

employs approximately 400 employees (Alan Cagle, Personal Communications, August 12, 2002). Eighteen fire stations are strategically placed throughout the city and are divided into four battalions. A battalion chief assigned to the shift manages each battalion on a daily basis. Each battalion has up to five engine companies and seven ladder trucks are stationed throughout the city limits. The Fire Department responded to over 20,000 incidents in 2001 (Alan Cagle, Personal Communications, August 12, 2002).

The Greensboro Fire Department is Internationally Accredited. This indicates a fire department is meeting international standards of equipment and providing services set by the Commission of Fire Accreditation International (CFAI). The benefits of being Accredited include but not limited to: promotes excellence in the organization, encourages quality improvement, identifies strengths and weaknesses within the organization, provides a systematic approach to address deficiencies, provides a mechanism for developing documents, including strategic plans, and recognizes a department committed to continuous improvement (Greensboro, Fire Department, 2002).

The Greensboro Fire Department also holds a Class 1 Insurance Services Office (ISO) Rating. The National Insurance Services Office rates communities and their available resources for response and mitigation of fires. The scale is from one to ten, with one being the best rating achievable. The rating was obtained in 1991 and has been consistently maintained since that time. The Class 1 rating is used as a tool to recruit new business to the community, resulting in new jobs for the citizens. The rating translates into a service capability that provides a safer environment when citizens are in commercial properties to work or conduct business (Greensboro Fire Department, 2002). The fire problem in Greensboro is not in commercial occupancies. It is in residential occupancies affecting the young and the elderly, just like the

nation's fire problem. However, when a fire occurred in a business or commercial occupancy, the fire loss amounts in dollars over the past three years greatly exceeded the amount in the residential occupancies (Battalion Chief David Douglas, Fire Prevention Bureau, Personal Communications, August 21, 2002).

The achievements by the Greensboro Fire Department of Accreditation and ISO rating show a commitment of providing the best service possible to the citizens of Greensboro. The goals of the local and national fire service can be summed to that of being efficient and safe. Francis L. Brannigan is quoted as saying, "that to be effective and safe we needed to minimize surprises on the fireground by learning everything possible about potential problems ahead of time (Jones, 1993).

Safety of firefighters and more efficient fire or emergency scene operation can be obtained by pre-incident planning. A definition of pre-planning or pre-incident planning is, a written document resulting from the gathering of general and detailed data to be used by responding personnel for determining the resources and actions necessary to mitigate anticipated emergencies at a specific facility (National Fire Protection Association, 1998). The purpose of pre-planning is to allow a fire department to conduct operations in a more effective and efficient manner. The critical information obtained will result in reduced property loss and fewer injuries to firefighters (Phelps and McDonald, 1984).

The results directly tie the third operational objective of the United States Fire Administration (USFA) to this research project – Reduce the loss of life from fire of firefighters. The fourth objective of the USFA – To promote within communities a comprehensive, multi-hazard risk-reduction plan led by the fire service organization, is to some degree, related to this topic as well. Pre-planning calculates the possibilities of a fire or emergency occurring in a

given locality. Pre-planning gives the on scene incident commander advanced knowledge of a structure that may reduce the chance for error in the decision making process. In fact, many decisions are made well ahead of time, before the incident occurs (Phelps and McDonald, 1984).

In the past, the Greensboro Fire Department implemented a pre-planning program late in the 1970's due to deficiencies recorded during an ISO inspection. The Department made the necessary corrections including implementing a pre-planning program and received a Class 2 rating. ISO typically gives the agency an implementation allowance to make the corrections suggested during the inspection. The Fire Department eventually received an ISO rating of Class I in 1991 (Deputy Fire Chief B.C. Cox, Personal Communications, August 12, 2002).

The program consists of a Pre-Plan Vital Information Sheet and a drawing of the facility involved. The information sheet consists of the following information: company name, address, emergency phone numbers, company assignments, water supply information, fire alarm information, utilities involved, roof construction, stair/elevator location, dumpster locations, and a space for any unusual problems. There are no guidelines on the drawings. Some companies draw plot diagrams while others draw floor layout plans. Some are hand drawn and others use a straight edge. This method continues today. The Pre-Plan Vital Information Sheet was put into a file on the Department's computer network in 1999 that allowed companies to save the written files on the shared network. All personnel now have access to the information sheet updates when an email is sent notifying of the changes. Fire companies then need to print the updated information to be placed in their pre-incident planning notebooks. Retrieval of the information on the fire ground relies on the new information being placed in the notebook. The pre-plans are currently updated annually and unofficially referred to as Pre-Incident Surveys (Assistant Fire Chief Warren Ritter, Personal Communications, August 21, 2002).

The Planning and Resource Section of the Fire Department has two information system specialists that are dedicated to supporting the Department's computer network (Network Administrator, Ken Brown, Personal Communication, September 3, 2002). The Network Administrator, Ken Brown had begun looking at pre-incident planning software applications in 2001. However, his knowledge is limited in what the fire officers need on emergency scenes since he does not have a fire service background (Network Administrator, Ken Brown, Personal Communication, September 3, 2002). "If the suppression battalion chief officers can tell me what they need on the emergency scene, I believe we can find a program that can work to fit their needs," said Ken Brown. At the present time, the Greensboro Fire Department has a database that includes all businesses within the city limits that is used by the Fire Prevention Section. This database has much of the same information commonly used in pre-planning. The current fire records management system has a database that includes all of the fire hydrants on the city's water supply system that is updated twice a year by the fire companies. Vital information statistics about water flow capability is already tracked by the Department (Network Administrator, Ken Brown, Personal Communication, September 3, 2002). Laptop computers are currently in each command vehicle and new mobile data computers (MDC) will be installed later this year. ArcExplorer, a computer mapping program, is currently on the laptops and used by the battalion chief officers. The City of Greensboro uses Environmental Systems Research Institute (ESRI) software to display Geographical Information System (GIS) files that in turn support the mapping program. Ken has suggested linking a pre-planning software to the mapping program to assist in providing needed information during response and once on the scene (Network Administrator, Ken Brown, Personal Communication, September 3, 2002).

The problem is not only significant due to the ISO Rating but because the Greensboro Fire Department is committed to reducing the loss of life among its citizens and firefighters. Chief Cox said, “I’m open to looking at other methods of pre-planning. Let’s see what you come up with.” Effective pre-incident planning causes less time to be spent making decisions concerning the fire prior to and after the situation size-up. This will improve overall scene safety of personnel, provide a more efficient fire attack, and produce better salvage operations (Price, 1992). The National Fire Protection Association has also addressed the need for adequate pre-incident planning in all occupancies (National Fire Protection Association, 1998).

This researcher found limited information on technology-based pre-incident planning programs. In fact, limited research had been conducted by EFO students on pre-planning since the class, *Strategic Analysis of Fire Department Operations* stopped being offered as part of the Executive Fire Officer Program. A large portion of the class dealt with pre-incident planning (Chase, 1989). “We know the information is valuable and there must be a way of obtaining the information on the emergency scene in a concise, organized manner” (Deputy Fire Chief, B.C. Cox, Personal Communications, August 12, 2002). This researcher then asked, “Is there a standard method of pre-incident planning? Are there national standards?”

Computer technology will play a major role in the future of the fire service. Every fire station has multiple desktop computers. Firefighters are already being tracked on the fireground by computers. Thermal image cameras with computer technology are on every ladder truck in the Greensboro Fire Department. Funds are budgeted for MDC units to be installed on every fire apparatus over the next two years (Deputy Fire Chief, B.C. Cox, Personal Communications, August 12, 2002). Chief Cox said, “they [computers] are not going away, we better find a way to use them to our advantage.” Ken Brown sees our future with an MDC in every fire unit with

equipment to automatically locate each unit. This would provide the closest unit to be dispatched to emergency scenes. Each MDC would have a map to suggest the best route of travel. Property information would be available with a click of a keystroke once the unit arrives on the scene. The scene commander could select from a series of digital pictures of each side of the building to assist in determining the most effective tactic. Even pictures of the interior of the building would be available (Network Administrator, Ken Brown, Personal Communications, September 3, 2002). Burt Phelps and Edward McDonald quoted a wise general who said, “The battleground is a very poor place to start to develop plans.” This is true too of the fireground. Pre-planning is one of the first steps in improving the fireground scenario (Phelps and McDonald, 1984).

This project relates to the class, Executive Analysis of Fire Service Operations in Emergency Management (EAFSOEM), through Unit Two of the Course Manual. This section discusses issues with emergency operations. The class discussed, in great detail, a fire that occurred in Philadelphia at One Meridian Plaza. Several problems occurred at this fire where firefighters lives were lost. Lack of knowledge about the high-rise building was a contributing factor to the problems encountered by the Philadelphia Fire Department (Deputy Fire Commissioner (Retired), Phil McLaughlin, Personal Communications, July 15, 2002).

LITERATURE REVIEW

Recognized Standards

Pre-planning has been termed by some as “knowing in advance what you are up against.” “If you know in advance what you are up against, it’s easier to defeat the enemy.” The enemy may not be a fire. It may be a chemical release, a winter storm, or a terrorist attack. To plan is to be forewarned. To be forewarned is to be prepared. We must be prepared! (Jenaway, 1992).

Similar to a military officer planning for battle, the emergency services officer must plan for battle. The fire officer must plan an offensive and defensive strategy just as a football coach plans a strategy. The ultimate goal is to have the firefighting team to perform efficiently and effectively (Jenaway, 1992).

This researcher found agreement from the fire service community that pre-incident planning is important and necessary. “Pre-fire planning is a key element for the fire professionals and its value cannot be overstated. Without it fire fighters are reduced to just reacting to a fire rather than being prepared for its many potential hazards (Jones, 1993).” Loss prevention activities are critical to fire protection needs. Pre-fire planning is one of those activities that fire departments need to do and should involve all suppression personnel on a continual basis (Jones, 1993). The National Fire Academy states, “Since a large percentage of businesses which suffer a serious fire never reopen, it is in everyone’s interest that such a fire does not happen” (Willy, 1998).

The NFPA addressed the problem of pre-incident planning in 1986. A large fire in a warehouse in Ohio prompted insurance officials to discuss these type fires and to determine if there were steps that could be taken to address the problem. A document, “*Before the Fire*” was developed that outlined several fires in sprinklered buildings. This report made recommendations relating to large fire loss in these type buildings. One of the recommendations was that the NFPA develop a document that addressed pre-incident planning for sprinklered occupancies. The document that was produced was, NFPA 1420 (*Recommended Practice for Pre-Incident Planning for Warehouse Occupancies*). Following the adoption of NFPA 1420, the Subcommittee of the Training Committee felt that the scope of the document should be expanded to include all occupancies. Therefore the document was renumbered and titled, NFPA 1620

(*Recommended Practice for Pre-Incident Planning*). This document replaced NFPA 1420 in 1998 (National Fire Protection Association, 1998)

The scope of NFPA 1620 is as follows:

1-1.1 This document is a recommended practice for evaluating the protection, construction, and operational features of specific occupancies to develop a pre-incident plan for responding to fire and other emergencies. The pre-incident plan should be used by responding personnel to manage fire and other emergencies in these facilities using the available resources.

A pre-incident plan should not be confused with fire inspections, which monitor code compliance.

1-1.2 Unlike fire prevention or fire safety inspections, pre-incident planning assumes that an incident will occur.

1-1.3 The authority having jurisdiction should determine the level of planning appropriate for the jurisdiction and the property being pre-planned

The Standard lists the specific occupancies needing to be pre-planned as: Assembly, Educational, Health Care, Detention and Correctional, Residential, Residential Board and Care, Mercantile, Business, Industrial, and Warehouse and Storage. The document goes on to say that the pre-incident plan will be most effective when coordinated with an incident management program such as NFPA 1561 (*Standard on Fire Department Incident Management System*) (National Fire Protection Association, 1998; National Fire Protection Association, 2002). The Greensboro Fire Department uses an incident management system referred to as Fire Command developed by Chief Alan Brunicini of the Phoenix Fire Department (City of Greensboro, 2002).

The *NFPA Fire Protection Handbook*, Seventeenth edition, recommends that all target hazards and special hazards be pre-planned (Wallace, 1991).

NFPA 1021 (*Standard for Fire Officer Professional Qualification*, 1997 edition), requires an officer meeting the performance requirements for Fire Officer I certification to:

2-6.1 Develop a pre-incident plan, given an assigned facility and preplanning policies, procedures, and forms, so that all required elements are identified and the appropriate forms are completed and processed in accordance with policies and procedures (Goodson and Sneed, 1998).

The CFAI addresses the need for pre-incident planning in Category II of the CFAI Accreditation Manual and list several performance indicators that are used in pre-incident planning as follows:

2A.7 The water supply system that provides available fire flow for the planning zones, major risks, key risks, and special hazard areas should be included in the planning effort.

2A.8 Fire protection suppression and detection systems have been identified and are considered in the planning process.

2B.1 Each planning zone is analyzed and risk factors evaluated in order to establish a standard of coverage.

2B.2 The maximum or worst fire risk(s) in each planning zone is/are identified and located, i.e. hazards that require the maximum amount of fire protection resources or that would result in the greatest loss of life or property;

The key or special hazard risk in each planning zone is identified and located, i.e. hazards that, if destroyed, would be a critical or essential economic loss to the community. This could also include cultural, environmental, or historical loss;

The typical or routine risks in each planning zone are identified, i.e. those risks most common to the planning zone.

The remote or isolated risks in each planning zone are identified, i.e. those risks most distant from other risks as to be almost unique to the planning zone; or

Other locally adopted equivalencies (City of Greensboro, 1999).

ISO has also addressed the need for pre-incident planning in their Fire Department Rating Schedule. It says, Pre-fire planning inspections of each commercial, industrial, institutional and other similar type building should be made twice a year. Records of the inspections should include complete and up-to-date notes and sketches (Insurance Services Officer, 1980).

Valuable points are to be gained in the area of training when every occupancy has a pre-incident plan. Departmental training and drills provide the perfect setting for the review and updating of pre-plans. ISO requires semi-annual re-inspections and reviews to earn full credit towards pre-fire planning inspections. Eighty percent credit is given for annual inspections (Willy, 1998).

IFSTA Water Supplies for Fire Protection suggests that a good pre-fire plan as “one of the most beneficial tools in increasing fire fighting strategy on the fireground (Willy, 1998).” Factory Mutual Engineering Corporation encourages property owners to cooperate with fire officials. They realized the importance of inspections and pre-incident planning, A joint effort gives the property owners and the fire department to talk and exchange information before an emergency occurs (Jones, 1993; Plaughner and Burns, 1991).

There is considerable documentation on the necessity of pre-planning, but there are problems that must be addressed. For instance, it may be impossible to pre-plan every business in some jurisdictions. The sheer number of multi-family residential, commercial and industrial occupancies may make it virtually impossible and impractical to perform the tasks (Jenaway,

1992). The retrieval method is an issue to the Greensboro Fire Department. It is difficult to access the information when multiple notebooks are carried in an already cramped apparatus cab (Assistant Chief Warren Ritter, Personal Communications, August 21, 2002). “If the Fire Ground Commander can’t find it [pre-incident plan], he can’t use it (Brunicini, 1985).” Fire departments must be able to prioritize the occupancies and plan the ones with the most hazards, highest property values, likelihood of a fire, or life safety risk. These occupancies are normally referred to as target hazards (Goodson and Sneed, 1998). However, the Greensboro Fire Department sees pre-planning every business as a viable option in maintaining the ISO Class I rating (Alan Cagle, Personal Communications, August 12, 2002). Also, the Department sees the information needed on a pre-incident plan is the same information that is needed on the fire ground (Assistant Chief Warren Ritter, Personal Communications, August 21, 2002).

Some fire departments have combined pre-incident planning and code enforcement inspections. The inspections do allow personnel to become familiar with the structures in their response areas but their attention is focused on code requirements for that occupancy. Pre-incident plans are conducted to provide emergency response personnel with information about the occupancy that they will need should a fire or other emergency develop on the premises. Combination of these efforts are discouraged, especially if that same people are doing both visits. Scheduling of pre-incident planning should be coordinated with code enforcement inspections so the occupants do not feel as they are being harassed. The owners or occupants must know how they benefit from the planning process as opposed to the inspection (Goodson and Sneed, 1998).

Fire departments have preplanned in the past. In many cases, no clear direction was provided to the personnel doing the surveys. Therefore the firefighters lost interest and the

program became stagnant. The nation's fire service has taken on many new responsibilities over the years and pre-planning has taken a back seat to other priorities (Price, 1992).

In summary, the value of pre-incident information and planning increases with the size and complexity of the building in which the fire occurs. For this reason, it is imperative that formal pre-fire planning be conducted on major facilities at least, and that the information be made available at the scene of the incident (Plaughner and Burns, 1991). Many departments developed pre-incident planning programs in the years past only to allow them to deteriorate due to other priorities. Departments do not need to re-invent the wheel. They only need to enhance what is already in place (Wallace, 1991). A large percentage of businesses never reopen after a fire. The nation's fire service has an obligation to their communities (Willy, 1998). Pre-incident planning is not required by law, but is addressed by many of the authorities in the fire service.

Pre-Incident Planning versus Emergency Scene

Pre-Incident Plans, pre-plans, pre-fire surveys, or pre-incident surveys all mean the same thing. Fire Departments across the country refer to their pre-fire planning with different titles. However, what is really happening is a pre-fire analysis. Francis Brannigan points out the word *plan* is really a misnomer. Planning indicates that a specific method of operation has been outlined. Some fire departments have changed to using the word surveys to prevent possible litigation when incident control does not go as planned. The fire service agrees that the information is needed on the emergency scene but it is probably better to allow incident commanders to use the information to formulate the tactics and strategy for each particular incident (Price, 1992).

The emergency scene is a hectic environment. To some degree, every emergency incident is an uncontrolled situation. The fewer decisions the emergency responders have to

make while in the hostile environment, the better. Therefore, the amount of knowledge available to the responding personnel may determine the success or failure of the emergency operations (Goodson and Sneed, 1998).

Richard Arwood of the Memphis Fire Department gives several examples of successful incidents in his applied research project regarding pre-fire planning. The St. Petersburg, Florida Fire Department averted disaster by implementing a pre-fire plan for a fire involving a building storing chlorine and swimming pools products. The written plan identified a strategy that would direct the incident commanders to allow the chemicals to burn while controlling run-off of the product. The Atlanta, Georgia Fire Department used a written pre-fire plan for a multiple alarm blaze involving an abandoned hotel. The plan described important construction features that allowed the on scene commander to remove the firefighters before the main portion of the roof collapsed. And the Santa Clara, California Fire Department encountered a large propane tank facility fire. Their plan advised to let the fire burn rather than attacking the fire. The dangers of the potential explosion were therefore minimized (Arwood, 1990).

The purpose of the pre-plan is to allow your department to conduct operations in a more effective and efficient manner. The incident commander must be aware of the critical information (Phelps and McDonald, 1984). Pre-fire planning is one of the first steps in improving the fireground scenario. The information obtained ahead of time is integrated into the incident command system to develop a flexible “plan of attack.” You literally are combating the incident before it happens (Christian, 1989).

It is unrealistic to think that a fire officer can arrive on the scene and operate efficiently without some advanced planning. Size-up is normally thought of an action conducted on arrival of the emergency scene. However it really begins well before the incident occurs with pre-

incident planning. The preliminary size up will provide officers insight into areas such as: type of construction, stair and exit locations, whether the building is sprinklered or has a standpipe system, the type of occupancy, exposures to other areas or buildings, water supply system, etc (Fried, 1983). With this type of information available, apparatus placement can be pre-determined and hose placement can be addressed. This will provide for a quicker and safer attack (Cox, 1985).

NFPA 1620 explains how the pre-incident plan assist during the incident.

- 2-3.1 The pre-incident plan should be the foundation for decision making during an emergency situation and provide important data that will assist the incident commander in developing appropriate strategies and tactics for managing the incident.
- 2-3.2 The pre-incident plan should help responding personnel identify critical factors that will affect the ultimate outcome of the incident, including personnel safety.
- 2-3.3 The pre-incident plan should provide for available facility personnel to advise responding personnel of current conditions upon arrival.
- 2-3.4 The information contained in a pre-incident plan should enable the incident commander to anticipate likely scenarios. A pre-incident plan should assist the incident commander in developing tactical options. Consulting the pre-incident plan throughout the incident should keep the incident commander aware of factors that might affect the success of the operation and the need for strategic or tactical adjustment. (National Fire Protection Association, 1998).

Emergency scene management becomes a combination of three factors. First, anticipate

what might happen before it does. Second, prepare the personnel through training based on the plan. And third, action through execution of the plan (Arwood, 1990; Jenaway, 1992).

Chief Alan Brunicini says the purpose of a pre-fire plan is to provide the Fire Ground Commander with information on the critical factors that cannot be seen from the command post. He says the plan should answer the following questions: (1) What factors are present? (2) What does the Fire Ground Commander need to know to be effective? (3) What factors can be seen from the command post? (4) How serious a problem can be caused by the unseen hazards? Chief Brunicini goes on to say that these questions may also assist in determining which buildings to pre-fire plan (Brunicini, 1985).

An advantage of the pre-incident plan is that training can be conducted in the fire stations with mock fire simulations. This allows the fire companies to project what might happen. It gives the front line firefighter a chance to see an overview of the structures in the area he or she will be responding (Wallace, 1991).

The Greensboro Fire Department has specific firefighters assigned to conducting code enforcement inspections and fire company personnel conducting pre-incident planning. Chief Cox sees this as an opportunity for fire inspectors and suppression firefighters to build a relationship. In the past, each division conducted their own inspections or pre-plans without consulting the other. "Since some of the same information is needed on both, we must learn to work together as a seamless organization," said Chief Cox (Personal Communications, August 12, 2002).

In summary, pre-fire plans have been called many different names over the years. However, the fire service agrees that pre-incident planning is needed and valuable in providing critical information on the emergency scene (Price, 1992). Fire departments continually give

credit to pre-planning for lives and property saved (Arwood, 1990). NFPA 1620 specifically addresses how the pre-incident plan assists on the emergency scene. However, firefighters need to know the benefits of pre-incident planning. Training in the stations can provide that insight which will in turn sell the program as a benefit to them (Price, 1992).

Documentation Methods

The format of the pre-incident plan is important if a department wants it to be used during emergency situations. The plan must be simple and not too complex or it will not be used. The primary data should include physical layout of the property, features to be used in firefighting, and the potential hazards to firefighters. The plan should be graphical in nature and use symbols whenever possible. At all cost, the format should avoid excessive detail. Some of the features may be too small to be readily identified and get lost in the complexity. The pre-incident plan should direct attention to the features that will affect tactical emergency scene decisions (Brunicini, 1985).

The information gathered for pre-incident plans is not used for many reasons. Allen Price, of the Rocky Mount Fire Department, indicated in his applied research project that other North Carolina fire departments have found they do not use the information due to storage and retrieval problems. The amount of information is important. Too much information cannot be effectively understood while too little is useless (Price, 1992). Another reason the plans are not used is that there is not clear direction for the department's pre-incident planning program. Operating guidelines must be developed and enforced to assure success of the program (Aurnhammer, 1990; Price, 1992; Wallace, 1991; Arwood, 1990; Jones, 1993).

Department's must determine their own specific pre-incident planning method. Some of the information gathered should remain in text format while other information should be drawn.

There are three types of drawings used, i.e. plot plans, floor plans, and elevations. Plot plans are used to indicate how the building is situated in relation to the surrounding exposures. Floor plans show the individual floors, including the roof. Elevations show the number of floors and the surrounding grade (Goodson and Sneed, 1998).

The complexity of the structure or facility will determine the type of plans needed. There are three levels of plans. An overview plan is the simplest. These plans are used for simple facilities with standard response and include such details as: public water supply, site access, and occupancy. These plans could also be used as a starting point for large, campus style facilities to act as a directory. A building level plan is used for unique buildings. These plans include such details as: building access, hazards, on site fire protection, water supply, structural construction considerations, and specific occupancy details. The process level plan is the most detailed. These plans include: process hazards, protection schemes, detailed occupancy considerations, room or area layouts, operational features such as ventilation and power. These plans could be for a part of a building that may pose a specific problem and would be needed by responding personnel. A fire department needs to decide what type of drawings they will use. The important thing is that they be similar in style, procedures, and content to maximize effectiveness (National Fire Protection Association, 1998).

The basic information gathered for the text and graphical information should be compiled on some type of field collection form. The Miami, Oklahoma Fire Department uses the term Facility Information Form or (FIF). They have a finished product titled Pre Emergency Plans (Willy, 1998). The Greensboro Fire Department uses a form titled Pre-Plan Vital Information Sheet that is used to collect the information and is used as a final product (Greensboro Fire Department, 2002). The Greensboro Fire Department mapping program has footprints of all

structures in the city that are drawn to scale. Ken Brown, stated, “We may be able to import these drawings from the GIS maps into a drawing program that would provide a starting point for the needed field information retrieval process (Personal Communications, September 3, 2002).”

Pre-incident planning documentation methods range from the very simple, such as a three ring binder to the very complex, such as technology based software packages. Fire departments are bound by budget constraints and municipal priorities that may limit the type of system utilized. However, fire department leaders know that pre-incident planning provides for a more efficient and effective emergency scene operation (Phelps and McDonald, 1984). A number of pre-incident planning methods have been developed and the department must only determine which one works best for them (Jenaway, 1992).

The three ring binder works well for small communities and can be adapted for medium sized communities. Depending on the complexity, the department may be able to include all of the critical information on the plot plan of the facility. Other scenarios may need a cover page with vital information that provide a directory to a more detailed plan. Smaller communities should keep the binders in all command vehicles and responding apparatus. Medium sized communities may elect to only carry pre-incident plans for their first response zones (Jenaway, 1992).

Security cabinets are another alternative. These cabinets are mounted at the actual facility. The cabinets provide easy access to Material Safety Data Sheets (MSDS), pre-incident plans, and emergency keys. Local management and the fire department have keys to maintain the most current information and are available to the responding units. Fire inspectors also can routinely check the cabinets to assure compliance. This method also relieves the fire department of liabilities in storing confidential information (Jenaway, 1992).

File cards and photography have also been used with some success in a variety of municipalities. File cards with pertinent information have been provided in the cabs of fire apparatus as well as in the communication or dispatch center. This method can provide key information in little space but is limited in the amount provided. Some fire departments have photographed each occupancy to provide a visual book of reference. The pictures are then coupled with layouts of the buildings identifying key items. Due to the size, this is typically difficult to take to the scene and relies on the dispatch center staff to relay and interpret information (Jenaway, 1992).

Videotaping is sometimes used in pre-incident planning. This process provides a visual review of the interior and exterior of the facility without leaving the fire station. This method does require the purchase of video cameras and training on their use to provide a quality end product. As with fire apparatus, poor equipment operators translate into poor usage. There are two immediate drawbacks to this method. First, the recorded information is not readily available on the emergency scene and second, the information is not easily updated. This method seems to be best for training purposes (Jenaway, 1992). The Greensboro Fire Department uses videotape in pre-incident planning hazardous material sites. The tape then provides new members of the team to review pre-determined locations without requiring the entire company to visit the property again (Assistant Chief Warren Ritter, Personal Communications, August 21, 2002).

Pre-incident planning using fax machines has been used in then Austin, Texas Fire Department. The city used to use the three ring binder format. It became impractical to carry hard copies of the plans when the numbers exceeded 3,000. Chief Bill Roberts of the Department posed the idea of using fax machines in the command vehicles to provide the needed information. His idea was to use cellular technology via portable modems to transfer the

information to the emergency scene. The Department purchased the fax machines and provided the administrative support to make the program work. The program functions by having the dispatch center locate the pre-incident plan computer file and with two keystrokes the plan is faxed to the command vehicle with the important information (Kalman, 1993).

William Jenaway wrote in his book, *Pre-Emergency Planning: A Guidebook for Fire Service Officers to Prepare for and Manage Emergency Situations*, in 1992 that the equipment for computer aided dispatch with readout screens in the apparatus was generally found to be too sensitive for use (Jenaway, 1992). In 1998, software provided by the Environmental System Research Institute (ESRI) supplied the Winston Salem, North Carolina Fire Department with a program well beyond what William Jenaway envisioned in 1992 (City of Winston Salem, 2002).

During an emergency, the ESRI program provides information in graphic form on a ruggedized PC in the fire vehicle. When the alarm is initiated, the firefighters proceed to their vehicles. The emergency information is sent by radio to the MDC. The fire officer then has the option of viewing a map defining the optimal route to the scene and then zooming into the exact location to determine the location of all available fire hydrants. Capacities and flow rates can then be displayed on the computer screen. Any known hazardous materials in the area can also be displayed. Once on the scene, the officer can view additional information. Information such as floor plans, water or gas line locations, and sprinkler systems can be selected through a link to an imaging component. In the case of an extensive emergency, additional information is available on the surrounding areas. Analysis can be done to assist with decisions regarding evacuation areas (City of Winston Salem, 2002).

Computers continue to advance. More and more software packages are being developed. FIREHOUSE® and Firesoft® can be used to store and retrieve data relating to particular

occupancies. These programs have the capabilities of managing large quantities of information and make it much easier to access it when needed during an emergency (Goodson and Sneed, 1998). The Fire Zone® quickly and easily creates accurate pre-incident drawings. The software program enables the user to draw faster and finish with a more accurate drawing. Many of the common drawing tasks are already programmed in the software. It also utilizes all of the NFPA 170 Fire Safety Symbols (National Fire Protection Association, 1999). The user can pick from pre-drawn shapes and just enter in the length of each wall or drag it to a new size. Types of streets and intersections are also pre-loaded into the software package (Cadzone.com, 2002). MaxResponder® is an integrated software application operating in a GIS (Geographic Information System) environment based on ESRI's MapObjects 2.0. It provides responding personnel access to all necessary information to make rapid decisions in an emergency situations. The database is queried when the fire officers selects a particular facility. A few keystrokes provide access to all available information on the location as well as information concerning the type of situation. The program can be enhanced to operate with digital data communication systems and Automated Vehicle Location (AVL) applications to allow communication between the responding unit and the dispatch center (MaxResponder, 2002).

Another software package available to assist with planning is RHAVE 1.5. This program does not produce a drawing for on scene use but assists fire departments with identifying potential hazards and determining the level of risk within a jurisdiction (Downers Grove, 2002; Coleman, 1997).

The City of Cary, North Carolina has placed all of their pre-incident plans on the internet. The user enters the site and sees the Cary Fire Department station listing. A keystroke enters the

operator into a specific fire station's list of pre-incident plans. A text document and drawing can then be viewed by selecting a particular address or business name (Cary, 2002).

Captain Jim Olsen from the Littleton Fire Rescue Department developed a software program called the pre-incident planning system (PIPS). After responding to the April 20, 1999, shootings at Columbine High School, he saw the value of an up-to-date, easy to use, digital pre-plan instead of a cumbersome paper version they currently used. The program he developed consists of a computer template that any emergency professional can take and adapt for use in their community. The program provides the operator to select a floor plan from any pre-planned facility. Using the computer mouse, specific rooms can be viewed. They can then move their controls to see a 360-degree panoramic view. Or they can even see what is down certain hallways, by simulating it on the computer. This knowledge can speed up rescue missions and eliminate or control hazards within the building (Littleton, 2002).

In summary, pre-incident planning has changed over the years. Many departments initially developed three ring binders to store information regarding facilities in their jurisdictions. Smaller fire departments may find these binders acceptable while larger ones may find them difficult due to the amount of structures in their response zones. Each department should determine which method will work for them (Jenaway, 1992). Guidelines should be developed and supported by the department administrators. The use of symbols and graphics is suggested by fire departments across the country that may simplify the finished product available on the emergency scene. Software programs continue to be developed that allow for more information available on the fire ground in a more concise, organized manner.

Information Needed

Pre-incident planning concentrates on where and how fires are most likely to occur and

how those fires are likely to behave. These plans focus on what is likely to happen and set the direction for incident mitigation. Pre-incident plans also focus on potential hazards to the on scene firefighters. In short, pre-incident plans give the firefighters information about the structure in order for them to function in a safe manner while in the hostile environment (Goodson and Sneed, 1998). The pre-incident plan should not go into too much detail. A formal script should not be developed. The more a plan describes step-by-step actions, the more chance of error exists. There are too many possibilities of fire behavior for all of them to be catalogued and described in detail (Clark, 1991).

Bill Jenaway writes, “Since every exposure cannot be pre-planned immediately, a prioritization process must be implemented (Jenaway, 1992).” Burt Phelps and Edward McDonald suggest that pre planning every building in a district is not practical. Departments should focus their efforts on structures that have the potential for large life loss and or large property loss. These buildings fit the definition of a target hazard (Phelps and McDonald, 1984). Target hazards may be defined as a facility, structure, operation process, or situation which may produce or propagate a fire or related emergency resulting in personal injury, large fire loss or significant damage or panic (Arwood, 1990). These type of facilities are the ones that a department’s pre-incident plan should be devised around when determining what information is needed (Phelps and McDonald, 1984).

The Rocky Mount, North Carolina Fire Department developed a pre-incident plan selection criteria method. Their plan calls for a plan for all buildings meeting the following criteria: any structure with a sprinkler or standpipe system, any structure over 15,000 square feet, any properties storing bulk amounts of toxic or hazardous materials in excess of 100 gallons or pounds, historical buildings, and any unique building or property (Price, 1992).

Bill Jenaway devised a method to prioritize all buildings or structures in an area. He developed a matrix based upon occupancy classification, size of facilities, people exposed, and life hazards. Point values are assigned to each structure or building within a district. A total score is comprised and a prioritization list is established. This is one of the first steps in implementing a department pre-incident planning program (Jenaway, 1992).

A department must also decide on what information is to be collected. Several key areas are suggested that include: General information, access, occupancy, hazards, construction, utilities, exterior, water supply, protection systems, exposures, tactical concerns, and non-fire emergencies (Jenaway, 1992; National Fire Protection Association, 1998). A drawing or graphical depiction is also recommended (Jenaway, 1992; National Fire Protection Association, 1998; Insurance Services Office, 1980).

General information provides key information about the facility and management. The type of occupancy is listed along with the business name. The plan should also indicate names and phone numbers of anyone to be called in the event of an emergency. This section should also list the normal business hours of operation (Jenaway, 1992; National Fire Protection Association, 1998).

Construction information will provide information into the type of construction according to NFPA standards. Other areas to include are: year built, square footage and number of floors, basements or attics, roof type and construction, any heavy items located on the roof and roof openings, wall construction, floor construction, interior stairs, and elevators types and their locations. Other items may also be included in this section depending on the type of building (Jenaway, 1992; National Fire Protection Association, 1998).

Every structure will have a variety of utilities serving it. Types of service should be noted and the method to shut off the supply of energy should be indicated. Examples include: natural gas, LP gas, fuel oil, electric, heat and cooling systems, emergency power, hot water, steam, other ventilation systems, and specialty gases used on the premises (Jenaway, 1992; National Fire Protection Association, 1998).

The exterior of any structure provides a myriad of potential problems on the emergency scene. Primary means of access is an important feature along with the best location for a command post. Access restrictions should be indicated. Some businesses provide a key box on the premises that may be used by the department if they know where it is and how to access it. Fences, wires, walls, equipment, gates, products, signs may prevent easy access. Exposures and their distances also pose potential problems. Exposure life hazards, fire load, and construction type need to be addressed (Jenaway, 1992; National Fire Protection Association, 1998).

Special hazards are those not typical for emergency response or fire department personnel. These environments can pose a significant additional risk if not evaluated properly during an emergency. Documentation of any special hazards should be listed on the pre-incident plan and may include: hazardous materials storage of radioactive materials, toxicological/biological agents, flammable/combustible liquids, and explosives. Other hazards include: underground storage tanks, process hazards, potential for falling glass or parapet walls, environmental impact hazards and communication impact hazards (radio reception problems) while operating inside of a structure (Jenaway, 1992; National Fire Protection Association, 1998).

Types of water supply available should be indicated. Static or positive sources will greatly affect how the operation is mitigated. Flow rates from hydrants should be determined along with the water flow rate needed to combat the fire (Jenaway, 1992; Wallace, 1991).

Other protection systems need to be identified in the pre-incident plan. Items include: fire pumps, types of fire alarm systems, alarm company identification, sprinkler and standpipe coverage and their types. Some businesses will have special types of protection systems such as halon, foam, and dry chemical systems. Their location and types should also be indicated on the plan (Jenaway, 1992; National Fire Protection Association, 1998).

Tactical concerns and a basic fire department action plan should be established. Rescue is of high concern on any fire scene. The department needs to know the numbers of occupants that may be inside of the structure. Life safety concerns such as evacuation plans, assembly points for occupants should be noted. Special needs individuals and their removal should also be addressed (Jenaway, 1992; National Fire Protection Association, 1998; Phelps and McDonald, 1984).

The 21st century has fire departments responding to more and more non-fire emergencies. Each facility should be evaluated for special circumstances such as: areas with the potential for above grade rescue or confined space rescue. Specialized rescue teams may be needed and a plan for their actions should be included (Jenaway, 1992; National Fire Protection Association, 1998).

A diagram or sketch of the structure or facility is needed for every pre-incident plan (Insurance Services Office, 1980). The drawings should avoid excessive detail. Using a pure scale drawing, some of the more important features may be too small to be readily identified. The graphic presentation should provide for these critical factors to stand out, yet not get lost in the details (Brunicini, 1985). The pre-incident plan should direct attention to the features, which

will affect tactical decisions and firefighting. Drawings should assume that the fireground commander will be positioned in front of the building or in an alternate predictable location and coincide with the view and orientation of the drawing (Brunicini, 1985). Items recommended for the sketch include: north point scale, street names and numbers, street water mains and their capacities, area dimensions, walls and story heights, roof constructions and coverings, windows and key obstructions, stairways, elevators, furnaces or boilers, chimneys, areas protected by sprinklers, fire department connections, standpipe risers and sizes, and significant ground slope (Jenaway, 1992).

Standard fire protection symbols on diagrams present an easy way to identify key factors that will affect scene operations (Brunicini, 1985). The NFPA developed a document that presents standard symbols to be used for fire safety and associated hazards (Plaughter and Burns, 1991). Technology based pre-incident planning drawings programs already include all of the fire protection symbols needed in developing pre-incident planning sketches (Cadzone.com, 2002; MaxResponder, 2002). The Cary, North Carolina Fire Department uses the standard symbols on their internet based pre-incident planning program (Cary, 2002).

A variation of drawings may be needed depending on the complexity of the facility. Plot plans will show the relationship of buildings, streets, exposures, and water supply system. Floor plans show each floor of the structure along with rooms, walls, doors, and key access points. Roof plans show the location of all objects on the roof. Fire departments may mix and match the different types of drawings to allow for the best view of the facility (Jenaway, 1992).

Other Executive Fire Officer Program students have surveyed fire departments throughout the country to determine what they are using and found that each use a variation of the information recommended by NFPA 1620 (Wallace, 1991; Willy, 1998). The Greensboro

Fire Department currently obtains the following information on their Pre-Plan Vital Information Sheet: business name and address, three emergency contact numbers, first and second alarm company assignments, building square footage, limited sprinkler and standpipe information, up to four hydrant locations but does not consistently record flow rates, alarm panel location, utility shut offs including gas, water, and electrical, roof construction and openings, stair and elevator locations, dumpster locations and distances from main building. Space is provided to check a box for unusual hazards with limited space to describe in detail. Finally, the form has space for general information about the fire company who completed the pre-incident plan (Greensboro Fire Department, 2002). The Greensboro Fire Department Fire Prevention Bureau also collects data on all occupancies inspected by them. Their inspectors collect such data as: occupancy information, construction information and year built, sprinkler and standpipe information, and alarm system information (Greensboro Fire Department, 2002). The assigned inspector is also identified. Ken Brown has suggested a possible link between their data fields and a technology based pre-incident planning program (Personal Communication, September 3, 2002).

One of the next steps in a pre-incident planning program is to formalize it. Standard operating guidelines or general operating guidelines should be written. This will show fire company members that the organization supports the program and will provide a method of completing the plans. The guidelines should include: purpose of the program, prioritization of occupancies, procedures for gathering the information (field collection sheet), equipment needed for property visit, required information and guideline for drawings and text entries, update schedule, method of distribution. Directions for computer entries if a technology based system is to be used (Price, 1992; Arwood, 1990; Wallace, 1991; Aurnhammer, 1990).

In summary, pre-incident plans give firefighters the needed information about a structure in order for them to operate in a safe manner on the emergency scene (Goodson and Sneed, 1998). Formal scripts should not be developed but specific building information must be accessible to the on scene companies (Clark, 1991). A prioritization method must be established before a fire department starts a pre-incident planning program. The department must then decide what information will be collected (Jenaway, 1992; National Fire Protection Association 1998). Each pre-incident plan will require a sketch of the facility with the utilization of standard fire safety symbols (Insurance Services Office, 1980; National Fire Protection Association, 1999). A variation of drawings may be used depending on the complexity of the building or structure (Jenaway, 1992). Finally, a program operation guideline must be written to ensure consistency among the various districts or stations in the fire department (Goodson and Sneed, 1998; Jenaway, 1992).

PROCEDURES

Definition of Terms

Incident/Fireground Commander. The person who assumes overall command of personnel and apparatus at the emergency incident scene (Brunicini, 1985).

MSDS. (Material Safety Data Sheet) The best source of information on a specific hazardous material is from this manufacturer's data (Greensboro Fire Department, 2001).

NFPA. (National Fire Protection Association) a private, voluntary, non-profit association whose activities include the production of technical and professional standards using a consensus approach in the development of standards (Greensboro Fire Department, 2001).

Occupancy Classification. The classifications given to structures for the National Building Code by the American Insurance Association or the authority having jurisdiction (Greensboro Fire Department, 2001).

Pre-fire planning (Pre-incident Planning). Advance planning of fire fighting operations at a particular location, taking into account all factors that will influence fire fighting tactics (Greensboro Fire Department, 2001).

Standpipe system. A water pipe system running from the base of a building to the roof with hose outlets at each floor level used for firefighting. The system is supported by a fire apparatus on the exterior of the building (Greensboro Fire Department, 2001).

Research

The problem that the Greensboro Fire Department did not have a pre-planning method that met the needs of the fire ground commander was reviewed and found to be an accurate statement. The goal of this historical and action research was to analyze the Fire Department's Pre-Incident Planning Program and determine a method of improvement. Historical research was conducted by reviewing the Greensboro Fire Department's program that was developed in the 1970's along with other programs detailed in applied research projects over the past 10 years. This researcher studied the process of pre-incident planning in the past and related it to the present method. Pre-incident planning was found to be a needed program by fire ground officers across the nation. Methods of selection criteria, information collection and recording procedures, and retrieval methods were analyzed and then applied to future methods of planning. The same information was found to be desired but a better way to retrieve it was needed. Personal interviews with leaders in the Greensboro Fire Department gave first hand knowledge of the problem locally. Fire departments have been doing pre-incident planning for many years,

either formally or informally. Many departments have developed their own methods of preplanning and designed drawings they felt met their needs. Pre-incident planning was not formally addressed by the NFPA until 1986 with the development of NFPA 1420 (*Recommended Practices for Pre-Incident Planning for Warehouse Occupancies*). The document was later re-numbered and revised to the current document NFPA 1620 (*Recommended Practice for Pre-Incident Planning*) in 1998. Action Research applied the historical data to the questions at hand to develop an end product that could be used by the Greensboro Fire Department:

- (1) Are their nationally recognized standards for fire department pre-incident planning?
- (2) How does pre-incident planning relate to emergency scene activities?
- (3) What documentation methods are currently used in pre-incident planning?
- (4) What information is needed when conducting pre-incident planning?

Fire service leaders in the past set the direction for the future. A need to know information about a structure was determined. The prior knowledge improved the success on the emergency scene. The City of Greensboro has grown, as many cities in the country have over the years. Original methods of documenting, recording and retrieval no longer meet the needs of the Department. Computer technology continues to improve. Larger amounts of information can be stored and quickly accessed through smaller, and more affordable computers. The modern technology now allows access to the information while on the emergency scene.

This researcher originally began the project while attending the *Executive Analysis of Fire Service Operations in Emergency Management* (EAFSOEM) in July of 2002. The National Fire Academy Learning Resource Center provided the initial information to determine the need for the study of the chosen topic. The idea was confirmed by the amount of previous research already conducted by EFOP students in the past.

After returning to Greensboro, a more thorough, exhaustive research process took place. This researcher met with Greensboro Fire Department staff in the Planning and Research Section to express the idea of an applied research project on August 7, 2002. A committee was formed to review the current method of pre-incident planning and determine a method of improvement. The group consisted of members of the Planning and Research staff and Emergency Services Division with an interest in pre-planning. The group set a goal to implement an improved program as the new technology is purchased over the next budget year and to coincide with recommendations by ISO.

The research questions were listed and the information obtained from the National Fire Academy was applied to each to start an outline for the project. The initial research at the National Fire Academy only allowed for limited photocopying so the Greensboro Public Library system was used to obtain an interlibrary loan of several applied research projects and books. An outline was developed for the overall project to include all of the areas required in the *Applied Research Guidelines* manual provided by the National Fire Academy. Further research involved use of the internet to obtain specific information from fire service technology vendors and specific fire department web sites. From there, a review of personal reference material was conducted. The Greensboro Fire Department Training Section provided resources in the form of periodicals, national standards, and departmental documents. Five interviews were conducted with local fire service personnel to provide personalization to the project. The interviews confirmed this researchers view, the Department needed to revise the current pre-incident planning method. The outline was developed in a Microsoft Word file and stored along with information obtained from personal interviews. A Research Proposal was submitted on August 22, 2002 via the internet. This portion of the overall process lasted until September, 2002.

Deputy Chief B.C. Cox provided insight into the ISO inspection process and related it to our pre-incident planning program. Chief Cox has played a key role in the last two ISO inspections. He serves in the position of Emergency Services Division Chief. A meeting was scheduled and took place on August 12, 2002 at the Administration Offices of the Greensboro Fire Department. The interview lasted approximately two hours. Chief Cox also played a key role in obtaining Fire Department Accreditation from CFAI. The interview questions focused around his involvement in the ISO and Accreditation processes. He also provided an in depth view of our current pre planning program and its history. Chief Cox expressed his sincere view of improving the quality of life for the citizens and firefighters of the City of Greensboro. He pointed out the value of pre-incident planning, the value of computers, and the value of working together with the Fire Prevention Bureau and Emergency Services Division to develop a program that would be with the Department well into the future.

The second interview with Battalion Chief David Douglas, Supervisor of the Fire Investigations Section took place via telephone. The conversation took place on August 21, 2002 for approximately 30 minutes. This interview centered around the fire problem in Greensboro. Chief Douglas brings experience from the North Carolina Officer of State Fire Marshal and expressed his views on fire safety. He explained the fire safety message from the Greensboro Fire Department focuses on the young and elderly populations. He also provided data on fire loss statistics over the past three years.

Ken Brown provided a viewpoint from a non-fire service professional during the third interview. He serves the Fire Department in the role of Information Systems Specialist along with one other specialist. Multiple meetings and telephone conversations took place during the research process. Mr. Brown tested several pre-incident planning software packages and

reviewed their hardware requirements. He explained the Greensboro Fire Prevention database in relation to what was already being collected. He was able to obtain reports to determine hydrant flow capacities via existing hydrant maps. Mr. Brown also explained the value of computerized mapping software and their use in a pre-incident planning program. He also provided insight into the future of mobile data computer terminals in the fire apparatus.

Alan Cagle provided information on Greensboro City statistics. Much of the correspondence was conducted via email. Mr. Cagle is assigned to the Planning and Research Section of the Department. He is responsible for managing data from the local Fire Records Management System.

Assistant Chief Warren Ritter led the Pre-Incident Planning Committee. Meetings were conducted monthly during the process and will continue during implementation of the suggested improvements. Chief Ritter coordinates activities in District Two of the Department and provided an explanation of our current Pre-Incident Planning Program. Chief Ritter gave much input on what he saw for improvement to the current system. He also discussed the methods of pre planning being conducted by the hazardous materials teams via videotape.

End Products Developed

The recent ISO inspection brought the issue of pre-incident planning to the forefront. The Greensboro Fire Department was meeting the objectives to maintain a Class I rating but an improved pre-incident planning process would improve the overall score. The Greensboro Fire Department implemented the current pre-incident planning program in the 1970's and has not made any changes since. Fire companies are not given any guidelines as to what buildings to pre plan. The ones that are conducted only obtain a limited amount of useful information for the fire ground commander. According to Ken Brown, existing software packages are available to

implement a technology based pre-incident planning program. The committee formed to study the process decided that first they wanted to know a priority order in which to conduct pre-incident planning that would meet the guidelines set by NFPA 1620. A matrix developed by Bill Jenaway was used to determine the selection process (Jenaway, 1992) as shown in Appendix C. Two supplements, Appendix A and B, were developed to assist companies in determining the type of Occupancy and Life Hazard classifications required on the matrix. Each fire company will be given a list of all of the inspectable structures in their response area coinciding with Fire Prevention Bureau records. The companies will then apply the matrix to each structure. Once the companies determine a score for a facility, the number will be placed on an Excel spreadsheet, Appendix D, and stored in a shared file on the Department computer network. After the selection order is determined, the General Operating Guideline developed will provide all front line personnel a clear outline of what would be expected in the revised pre-incident planning program. General Operating Guidelines were reviewed from previous applied research projects to develop one that would meet the needs of the Greensboro Fire Department. Primarily the guideline states the objectives and purpose of the program. The procedures to be used in developing each pre-plan are explained along with guidelines on collecting the data and drawing the sketch. The General Operating Guideline is shown in Appendix E. Each pre-incident plan will need building specific information that will be collected utilizing a new form, the Field Collection Sheet, as shown in Appendix F. The form was developed mainly utilizing NFPA 1620 and the recommendations set by Bill Jenaway (Jenaway, 1992, National Fire Protection Association, 1998). This form is also stored on the fire department computer network and available for printing in each station. The fire companies will use this form to record the requested information while conducting the pre-incident plan. They will then enter the

information into the network file that will be linked to the actual pre-incident planning software. The specific software package is yet to be determined by the Greensboro Fire Department.

Assumptions and Limitations

This researcher conducted a literary review by researching periodicals, reference books, the internet, and personal interviews. It was assumed the written information was valid and correct. Interviews were personal viewpoints of the individual only. Much of research in the past was conducted by students taking the class, *Strategic Analysis of Fire Department Operations*, from the National Fire Academy. One section of the class dealt with pre-incident planning. However, this class is no longer a part of the program. When the class stopped being offered, the research stopped as well. A large percentage of the data collected by this researcher is as much as ten years old. Limited information was available on using technology based pre-incident planning programs. As with each applied research project, the six-month time frame limits the amount of time to implement an idea. Therefore the project must project what will happen in the future.

Since this researcher has been involved in the Executive Fire Officer Program, a new edition of the guidelines for writing in *American Psychological Association* format have been published. However, with the approval of the National Fire Academy staff, the fourth edition was allowed to be used for the applied research project.

RESULTS

Research Questions

Are there nationally recognized standards for fire department pre-incident planning? This is the first question answered by this researcher. The NFPA first addressed the problem of pre-incident planning in 1986 with the implementation of NFPA 1420 (*Recommended Practice*

for Pre-Incident Planning for Warehouse Occupancies). The original Standard was later revised to form NFPA 1620 (*Recommended Practice for Pre-Incident Planning*) (National Fire Protection Association, 1998). This Standard recommends using the pre-incident plan to manage a fire or other emergencies encountered in conjunction with NFPA 1561 (*Standard on Fire Department Incident Management System*). NFPA 1620 gives the authority of decided which buildings to pre-plan to the fire department protecting the jurisdiction. It goes on to specify the types of occupancies to pre-plan (National Fire Protection Association, 1998). The *NFPA Fire Protection Handbook*, recommends pre-planning all target hazards and special hazards in a given jurisdiction (Wallace, 1991). NFPA 1021 (*Standard for Fire Officer Professional Qualification*) requires an officer meeting the performance objectives for Fire Officer I to develop a pre-incident plan using department policies, procedures, and forms so that all required elements are identified (Goodson and Sneed, 1998).

The CFAI addresses pre-incident planning in the Accreditation Manual and list performance indicators. It specifies that the water supply system should be planned during the planning effort. Fire protection suppression and detection systems should be identified when analyzing each response zone for risk factors. The worst fire risks should be identified along with any special hazards which if destroyed would be critical or essential to economic loss to the community (Greensboro Fire Department, 2002).

ISO specifically addresses the need for pre-incident planning. It requires pre-fire planning inspections twice per year of each commercial, industrial, institutional and other similar type building. Sketches are also required of each pre-planned building (Insurance Services Office, 1980). Full credit is given when pre-planning efforts are updated two times per year, but eighty percent credit is given for annual inspections (Willy, 1998).

Other fire service related organizations support pre-incident planning efforts. IFSTA suggests that a good pre-fire plan is one of the most beneficial tools in increasing fire fighting strategy on the fireground (Willy, 1998). Factory Mutual Engineering Corporation encourages property owners to cooperate with fire officials in a joint effort to exchange information before an emergency occurs (Jones, 1993; Plaughter and Burns, 1991).

The research indicates there are national standards for pre-incident planning and are supported by fire service organizations. Emergency service agencies are not bound by these standards but are provided guidelines to develop a program that will allow the emergency scene personnel to be prepared (Jenaway, 1992).

How does pre-incident planning relate to the emergency scene activities? This was the second question answered. Pre-incident plans are known by a variety of names. However, the word “planning” indicates that a specific method of operation has been outlined. The fire service agrees that prior information is needed on the emergency scene but instead of a specific plan, it is better to allow the incident commanders to use the information to formulate the tactics and strategy for each incident (Price, 1992). Fire service leaders also agree that the fewer decisions made while in the hostile environment, the better (Goodson and Sneed, 1998). Fire departments across the nation can give examples of how pre-incident planning efforts saved lives and buildings (Arwood, 1990). The pre-incident plan is one of the first steps in improving the fireground scenario. The information obtained ahead of time is integrated into the incident command system to develop a flexible “plan of attack.” The emergency scene is literally being combated before it happens (Christian, 1989). Information such as, type of building construction, stair locations, type of occupancy, and type of water supply system are invaluable to the incident commander when planning for apparatus placement or hose stream applications.

The information provides for a quicker and safer attack (Cox, 1985). Pre-incident plans have value away from the emergency scene as well. Mock fire simulations can be conducted while firefighting personnel are in the stations (Wallace, 1991). Front line firefighters and fire inspectors are also given the opportunity to work together since so much of the information is required in both areas. Relationships that may have faltered can be enhanced when everyone has the same objective in mind (Deputy Chief B.C. Cox, Personal Communications, August 12, 2002).

What documentation methods are currently used in pre-incident planning? This was the third research question explored. The format of the pre-incident plan is important if a department wants it to be used on the emergency scene. The forms must be simple to use and easy to read in a hectic environment. It should be graphical in nature and use standard symbols whenever possible (National Fire Protection Association, 1999). The pre-incident plan should direct attention to the features that will affect the tactical outcome (Brunicini, 1985). Fire departments have developed their own systems of pre planning. Some use sketches and some do not. Some use three ring binders to store the information and some use security cabinets while others use file cards (Jenaway, 1992). A department should develop a standard or general operating guideline to support the program and allow everyone to know exactly what is expected of them (Aurnhammer, 1990; Price, 1992; Wallace, 1991; Arwood, 1990; Jones, 1993). Some departments are now experimenting with technology-based retrieval systems. Fax machines have been used but now software is being developed to support large amounts of textual and graphical information that is available on the emergency scene (City of Winston Salem, 2002; Goodson and Sneed, 1998; Cadzone.com, 2002; Coleman, 1997; Cary, 2002; Littleton, 2002).

The fourth and last question: What information is needed when conducting pre-incident planning? Pre-incident planning assumes an incident will occur. It focuses on the hazards to the firefighters (Goodson and Sneed, 1998). It is not possible, or practical, to pre-plan every business in a large district. Departments must focus their efforts on the potential of large life loss or property loss (Phelps and McDonald, 1984). Fire departments must develop a method of determining which buildings will be pre-planned and which ones will be done first (Price, 1993; Jenaway, 1992). A department must then decide what information will be collected. NFPA 1620 provides an in depth resource in that area (National Fire Protection Association, 1998). Information generally falls into the following headings: General information, Access, Occupancy, Hazards, Construction, Utilities, Exterior, Water Supply, Protection Systems, Exposures, Tactical Concerns, and Non-Fire Emergencies. Each building or structure pre-incident plan will need a drawing or sketch (Insurance Services Office, 1980). The drawings should use standard fire protection symbols as designed by NFPA 170 (National Fire Protection Association, 1999). Some buildings may require more than one drawing depending on the complexity. Types of drawings will include: plot, floor, and roof plans. Fire departments may mix and match the different types to allow for the best view (Jenaway, 1992).

Unexpected Findings

The previous research indicated the requirement by ISO of pre-incident planning. This organization requires that every commercial, industrial, institutional occupancies and other similar type buildings in the jurisdiction to be pre-planned. The City of Greensboro has over 13,000 occupancies that meet that criteria (Alan Cagle, Personal Communications, August 12, 2002). Another unexpected finding was that of a lack of a General Operating Guideline for pre-incident planning in the Greensboro Fire Department. The organization has been conducting the

plans since the 1970's but no one had written down the procedures. One last area that was unpredicted was the need for a roof plan. Fireground commanders consistently put firefighters inside of burning structures without ever knowing what is above them. A sketch of that area would provide a safety feature that was never realized (Assistant Chief Warren Ritter, Personal Communications, August 21, 2002).

Final Product

The Greensboro Fire Department did not have guidelines for their Pre-Incident Planning Program. There were no selection criteria and the required information was not established. A matrix developed by Bill Jenaway was used to determine the selection process as shown in Appendix C. Two supplements, Appendix A and B, were developed to assist companies in determining the type of Occupancy and Life Hazard classifications required on the matrix. The fire companies were given a list of all of the inspectable occupancies in their response zones and asked to establish a priority list using the matrix and supplements. The information was placed in a computerized file as shown in Appendix D. A general operating guideline was developed and written to explain the revised program as seen in Appendix E. Finally, a Field Collection Sheet was developed that lists all of the recommended topics that were identified in the applied research project. The Field Collection Sheet is available in Appendix F.

DISCUSSION

Preplans save lives and property. This researcher believes the previous statement. Pre-incident planning efforts have taken place for years. Fire departments identified during the research process identified specific examples of how pre planning saved lives and property. The Greensboro Fire Department began pre-planning structures in the 1970's due to an ISO audit. The program has struggled through the years. As a battalion chief assigned to the Emergency

Services Section, I see the value in revising the Pre-Incident Planning Program. I continuously need more information that is just not available in our existing program.

Standards and professional organizations throughout our country back my opinion up and agree that preplanning is important. The NFPA is a leading fire service organization in recommending solutions to fire service problems. The current Standard, NFPA 1620, outlines what is needed in a pre-incident planning program. NFPA 1620 describes in detail exactly what information is needed in a pre-incident plan document (National Fire Protection Association, 1998). The standard for officer certification requires officer candidates to understand the policies and procedures of a department's pre-planning program (Goodson and Sneed, 1998). The CFAI accredits fire service agencies worldwide. They list several performance indicators that are used in pre-incident planning (City of Greensboro, 1999).

Greensboro started pre-planning due to an ISO review. ISO continues to see the value in pre-incident planning and additional credit to departments that pre plan every commercial, industrial, institutional, and other similar structures twice per year (Willy, 1998). The Greensboro Fire Department was developing a plan for improvement even before this researcher began the project. The Planning and Research Section had already begun looking at technological solutions to improving the program. A committee was formed when the applied research project began and is well under way in providing a method of improvement that will take the department into the future.

The problem with which buildings to pre-plan has been an issue for years in fire departments across the nation. ISO requires all business related occupancies to be pre-planned. This researcher disagrees with that objective. The research indicated that pre planning every structure is not practical for larger departments and a selection method must be identified by

those organizations. Bill Jenaway wrote a book on pre-planning and devised a method to determine a priority order in the selection process (Jenaway, 1992). This researcher took his efforts and applied them to Greensboro Fire Department and the 21st century technological age. My interpretation is that Mr. Jenaway's ideas were right on track in the 1980's and can still be applied to today's fire service.

Some departments in the country have tried to combine pre-planning and code enforcement inspections. However, many departments in the country discourage this method due to the fact they are very different in nature. Fire inspections primarily focus on code related issues while pre-incident planning focuses on fire company familiarization (Goodson and Sneed, 1998). The Greensboro Fire Department has a separate section that has the responsibility of code enforcement. This researcher sees a value in having the two different sections working together. Some of the needed information in the pre-plan is the same information needed in the code enforcement inspection. The two divisions can share the databases. Both groups can then have access to the information they need.

Research indicated that firefighters lost interest in pre-planning efforts when the programs lost the attention of the leaders in the organizations. Fire Departments have taken on new responsibilities since the inception of pre-incident planning (Price, 1992). This researcher, and many others in the fire service, see a continual need to maintain pre-incident planning programs. The City of Greensboro has a fire problem in residential properties and not necessarily in commercial structures. However, when a fire occurs in a business or commercial occupancy, the fire loss is often substantial. Therefore, fire departments must support pre-incident planning efforts and not just focus on the current existing nation's fire problem with the

young and elderly. In fact, pre-planning efforts are becoming easier. Computer technology is providing quick access to the information fireground commanders have needed for years.

Fireground leaders describe almost every emergency scene as an uncontrolled situation. The fewer decisions needed to be made while on the emergency scene, the better. Therefore, the amount of information available to the responding personnel may determine the success of the emergency scene (Goodson and Sneed, 1998). Buildings have been saved and lives have been protected with comprehensive pre-incident plans. This researcher agrees with comments made by Bill Jenaway. First, anticipate what might happen before it does. Second, prepare the personnel through training on the devised plan. And third, action through execution of the plan (Jenaway, 1992).

In the past, pre-incident plans had to be kept to a minimum. Only so much information could be comprehended while in the hectic environment of the emergency scene. Today, computer technology provides only the information requested to be scene by the viewer. Drawings or sketches can be quickly learned using the same technology. The Greensboro Fire Department currently uses three ring binders for all of the pre-incident planning documentation. This researcher found existing software packages are available to incorporate the technology into the existing laptop computers already carried in each command vehicle.

The purpose of this research project was to analyze pre-incident planning and determine methods for improvement. The research questions were applied to the problem and the purpose. A unified conclusion was identified throughout the project. Pre-incident planning does improve the emergency scene operations. Pre-incident planning makes for a more efficient scene that in turns saves property and more importantly, lives.

RECOMMENDATIONS

The Greensboro Fire Department has conducted pre-incident planning for a number of years with no clear-cut guidelines for the program. The program has been successful in relation to the number of business or industry related fires. Along with a good code enforcement program, the fire problem has been held to the residential community. Both areas of the city's fire problem are being addressed by the Fire Prevention Bureau within the Department. However, when a fire occurs, the efficiency and safety of the emergency scene is in question. The research pointed out areas in need of improvement.

Some fire departments have combined code enforcement efforts with pre-incident planning using the same personnel to do both. This researcher agrees with the supporting material in the literature review that this is not a good idea. The Greensboro Fire Department already has a section conducting fire inspections and this researcher recommends no changes. However, there may be methods to share databases in obtaining information needed for both program.

The use of computer technology should play a major role in response for fire departments in the coming years. Computer software programs are available at affordable prices. Fire service leaders agree that the new technology could provide for a safer, more efficiently ran emergency scene. This researcher is recommending to pursue the technology avenue in revising the current program. The Planning and Research Section should continue to investigate the available software and make recommendations for purchase to the Fire Department Leadership Team.

NFPA has written a document that specifically addresses implementation of a pre-incident planning program. NFPA 1620 should be used as a guideline for developing or revising

an existing program. This researcher is recommending the use of the NFPA document to support the revision of the current program.

Another Standard written is *NFPA 170, Standard for Fire Safety Symbols*. This document identifies specific symbols to be used during pre-incident planning. The symbols identify key factors on the pre-plan drawing that are needed on the emergency scene.

Fire departments need to prioritize the structures for pre-planning within the jurisdiction once the department decides there is a need for pre-incident planning. The matrix provided by Bill Jenaway (Appendix C) and the supporting guidelines (Appendix A, B, D) will assist departments in determining which structures to pre-plan. ISO recommends pre-incident planning each commercial, industrial, and other similar type buildings twice each year. This researcher suggest attempting to meet that goal, but spread out the efforts over a multi-year period. The Greensboro Fire Department should use the matrix supplied in the research project to determine where to start the revised program. Fire companies can then begin an endeavor that may spread out over the next several years.

This researcher has provided a general operating guideline (Appendix E) that should be used to provide training and support for the program. An operating guideline shows commitment from the organization. Once the Leadership Team approves the suggested guidelines, a pilot program will be conducted in one station's response area to determine the need for revisions before being presented to the entire department.

In the future, more research will be needed on technology based pre-incident planning programs. Software will continue to improve. Hardware will continue to run faster and store more and more information. Applications for laptops and mobile data computers will become more available on the emergency scene. There unlimited uses have not even been thought of yet.

I challenge the new recruit firefighter just out of the fire academy. You have always had the internet available. You may have never seen a manual typewriter. You must think ahead. You are the next generation executive fire officer. A few of you challenged by Microsoft's™ computer flight simulators will go on to be pilots. But some of you will bring those acquired technology skills into the fire service and lead our profession into the 21st century.

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